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OBSERVATIONS ON THE GENESIS OF CUTANEOUS LOCAL SIGN

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Sensory fibers mediating cutaneous local sign must acquire specific central associations selectively adjusted to the locus of peripheral termination. The motion picture illustrates some results of an attempt to analyze factors responsible for orderly patterning of relations between sensory cutaneous field and brain centers.

Mechanical guidance and functional adaptation as the possible factors were eliminated. Orderly recovery of cutaneous localizing reflexes followed section and regeneration of cranial and spinal sensory roots in newt and/or tadpole despite intermixing of fibers in the scar. Regeneration of the transected root V following peripheral cross-union of ophthalmic and mandibular nerves in adult newts resulted in recovery of reversed withdrawal responses elicited from the ophthalmic-innervated mandibular area. Contralateral misdirection of response developed in frogs following crossing of ophthalmic nerves, transplantation of skin flaps, and contralateral union of dorsal roots in the tadpole. The usual synaptic patterns were laid down despite maladaptive function. Thoracic nerves forced to grow into digital integument of transplanted or deafferented hind limbs formed central connections appropriate for digital rather than thoracic skin.

Development of cutaneous local sign apparently depends upon a refined field-like differentiation of the entire integument. The differentiated integument induces a parallel specification of primary sensory neurons by which patterning of central synapses is regulated in accordance with the chemoaffinity theory of synaptic formation. Specificity among the central second order neurons is also indicated.

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